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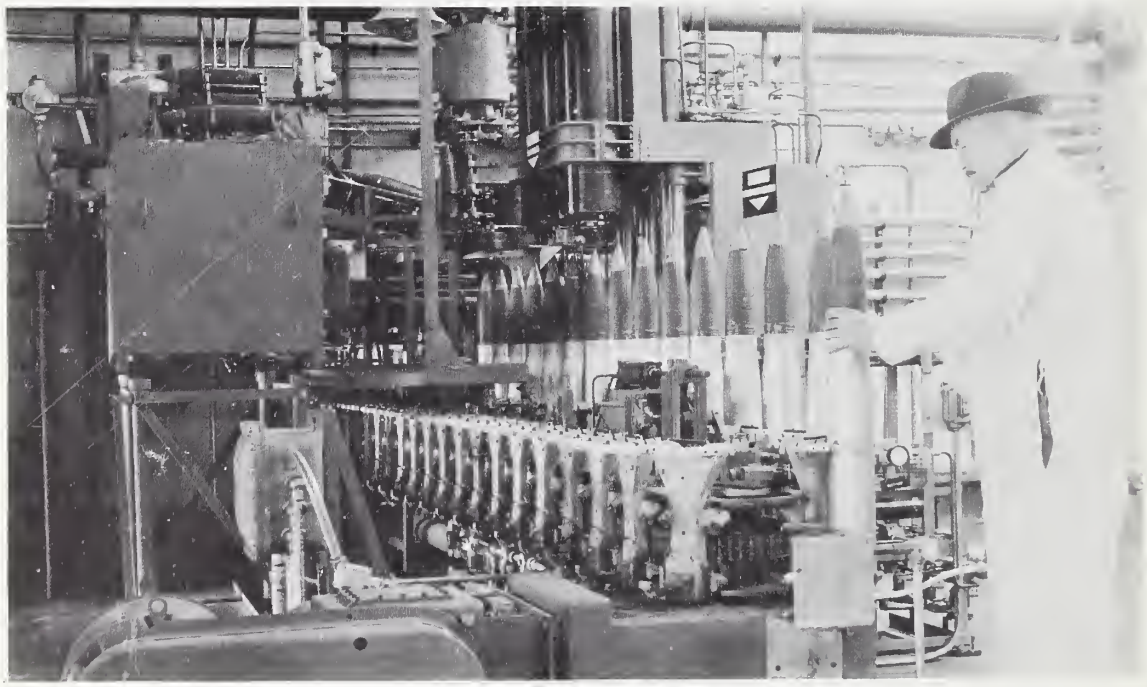
SAFETY DIGEST

July 1963

UNITED STATES ARMY
MUNITIONS COMMAND



introduction

F. A. HANSEN
Major General, USA
United States Army Munitions Command

There are two very fundamental and basic things that we of the U. S. Army Munitions Command are continuously striving for -- a safe operation and a good product. This product must not only be reliable but acceptable to our customers in all respects.

In our commodity, the finished product is designed to be safe until it is ready for use to produce a hazardous effect. What we must avoid are the hazards involved in its manufacture. Should an accident occur, injuries will result.

Generally speaking, injuries or fatalities begin happening whenever people fail to abide by the rules. In other words human error must be avoided.

Like any other business or industry, we cannot afford to pay the price of such accidents which not only affect production but also result in human suffering and property damage.

It is my policy that every subcommander of the U. S. Army Munitions Command assure that the proven accident prevention techniques, now available, become an integral part of all planning and all operations. When this attitude is shared by every member of this Command we will be well on the road toward sustaining our productivity.

F. A. HANSEN
Major General, USA

The Safety Digest is an AMC Pamphlet prepared by the Safety Division, U. S. Army Materiel Command. Its purpose is to disseminate information which can materially influence and improve safety programs at all Command establishments.

Articles are included to supplement technical knowledge as well as practical knowledge gained through experience. They provide a basis for the further refinement of safety measures already incorporated in operating procedures and process layout. To achieve maximum effectiveness, the Safety Digest should be given widespread circulation at each AMC establishment.

Articles appearing in the Safety Digest are unclassified and are not copyrighted. They may be reproduced as desired in order to bring pertinent accident prevention information to the attention of all employees.

Unclassified material believed to be of interest or benefit to other establishments is welcomed for publication in the Safety Digest. Please send articles for review to: Commanding Officer, U. S. Army Materiel Command Field Safety Agency, Charlestown, Indiana. If possible, include pictures, charts, drawings, and illustrations that clarify and heighten interest in your presentation.

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A METHOD OF HAZARD CONTROL IN A RESEARCH AND DEVELOPMENT LABORATORY

By Joseph F. Voeglein, U.A. Army Chemical R & D Laboratories, Edgewood Arsenal

The potential hazards confronted at the U. S. Army Chemical Research and Development Laboratories (CRDL) run through a complete list of the known, as well as some of the unknown. However, accidents being experienced are of the same type as those in any industrial organization. Accidents involving inherently hazardous materials handled in research and development operations have been rare. We believe that this can be attributed, in part, to a tool that we call a "Safety Procedure".

The CRDL Safety Procedure consists of a documentation of the requirements necessary to control a specific operation for the purpose of preventing accidents. For uniformity a printed form cover page and final page are provided. The cover contains the title, organization, location, date submitted, tentative operating date, number of personnel, a safety equipment check list and expiration date. The final page provides for signatures for concurrence and approval, signatures of operating personnel and date of approval. In addition, an outline is included for the author to follow. This is also intended to provide uniformity and to insure that all necessary data are included.

The CRDL Safety Procedure includes the following items:

The title, a description of the work to be done, items of equipment to be used, with a description, drawing and/or photograph if necessary.

Next, a list of materials to be used, including physical properties, hazards, weight or volume, dimensions, flammability, toxicity and explosive data, if applicable, plus any references to published data.

Following this, the step-by-step procedure of the operation is described in sequence of occurrence.

After this, the hazards, both actual and potential, are described, with the methods of control included. Also in this section are the emergency procedures in case of accident, first aid and fire fighting, and a disaster plan where necessary.

The next section includes safety equipment, decontamination, type of communications and warning signs, whenever any of these are applicable.

The remaining sections are devoted to useful data obtained from similar operations, additional safety instructions, a listing of applicable reference publications, and personnel and material limits when required.

The final section is devoted to the description of coordination required with other units or organizations.

The CRDL Safety Procedure is prepared for those inherently hazardous operations not specifically covered by existing regulations or operating procedures. This is not new but perhaps our approach is different. To begin with, this document is not a typical Standing Operating Procedure which includes a section or paragraph on safety requirements, but is devoted entirely to the safe performance of an operation and may cover anything from the laboratory bench scale preparation of a pyrotechnic mixture to the operation of a full scale chemical pilot plant. It is prepared by the designated supervisor of the operation and presented to the Safety Office for review prior to submission for tentative or final approval.

Worthy of note at this point are the advantages gained by the supervisor, his assistants and the safety program in the self-preparation of the requirements. Individuals are more prone to follow the restrictions and provisions set forth by themselves than those imposed by a regulatory body. Much knowledge is gained and an atmosphere of cooperation is established between the safety personnel and operating officials during the joint study of the proposed operation.

As a typical example let us select an operation which concerns the experimental synthesis of a new chemical compound for the purpose of developing the manufacturing process. The reaction involves uncommon chemicals with limited data available as well as common chemicals with well known hazards. In this hypothetical example the reaction has been tested in laboratory studies and is determined to be safe to operate on a larger scale.

The preliminary draft of the proposed operation is presented to the Safety Office for review. Usually some discussion has transpired prior to the submission of the draft. In general these discussions concern the inherent hazards, chemical and physical properties, toxicity data, etc., available or developed by studies in our own laboratories when required.

With a preliminary description it is now possible to review the operation in detail for hazard control.

The preliminaries of title, purpose, etc., having been dispensed with, the first section to be reviewed contains the items of equipment to be used. These are considered for adequacy of design to control and to contain the reaction, for compliance with code requirements where applicable and if testing has been or is going to be performed as required.

The next section lists the materials to be used. Normally the operating unit will have compiled the available data on the intermediate chemical compounds to be used, and also the product. However, this usually needs to be questioned and in some cases additional laboratory tests are necesssary to obtain more complete data. This is the critical information required to design the hazard control and protection systems. In the Safety Procedure a brief description of common chemicals is given, along with their hazards. The uncommon compounds are treated in more detail, with a complete statement of the inherent hazards and physiological effects, if any.

It should be noted here that normally these operations are conducted in a building designed for the purpose, with approved utilities, ventilation and waste product treatment and control equipment and facilities. However, the adequacy of these existing facilities must be determined with respect to the hazardous properties of the materials used in a specific operation. An important consideration in this type of operation is the health hazard to operational personnel. If it is determined that the engineering of the process equipment has not eliminated these hazards, the use of personal protective clothing and equipment becomes a requirement.

Now the step-by-step safe operating procedure is reviewed. Here it is necessary to envision what the result may be if there is an unexpected occurrence such as a side reaction, a malfunction of an item of process equipment, failure of instrumentation, an electrical power failure, or introduction of reactants in the wrong sequence. Also considered are possibilities such as the introduction of a foreign substance or an improperly identified chemical. This aspect of the procedure involves exploring the very worst that can happen and determining how to prevent or minimize the results. This may occasionally border on the ridiculous, but in the cause of safety no possibility is overlooked. This investigation requires a study of the sequence of operations by following

the flow chart and questioning every item involved. Desk review alone will not suffice, but must be followed by on-site review of the entire process and related equipment. Close scrutiny may reveal a mistake in construction or an omission from the written document.

Where supervision is an immediate controlling factor at a point in the operation, the supervisory responsibility is stated in that step of the procedure. Following the step procedure, reviews are made of the listed hazards (actual and potential), the methods of controlling these hazards, and the emergency action in the event of accident. The adequacy of these factors is thoroughly questioned. Here the first aid and other medical considerations are also included. These are provided or concurred in by the Medical Research Directorate of the Laboratories. Fire fighting methods are included which may require the assistance of Edgewood Arsenal Post Fire Department personnel in devising methods by test.

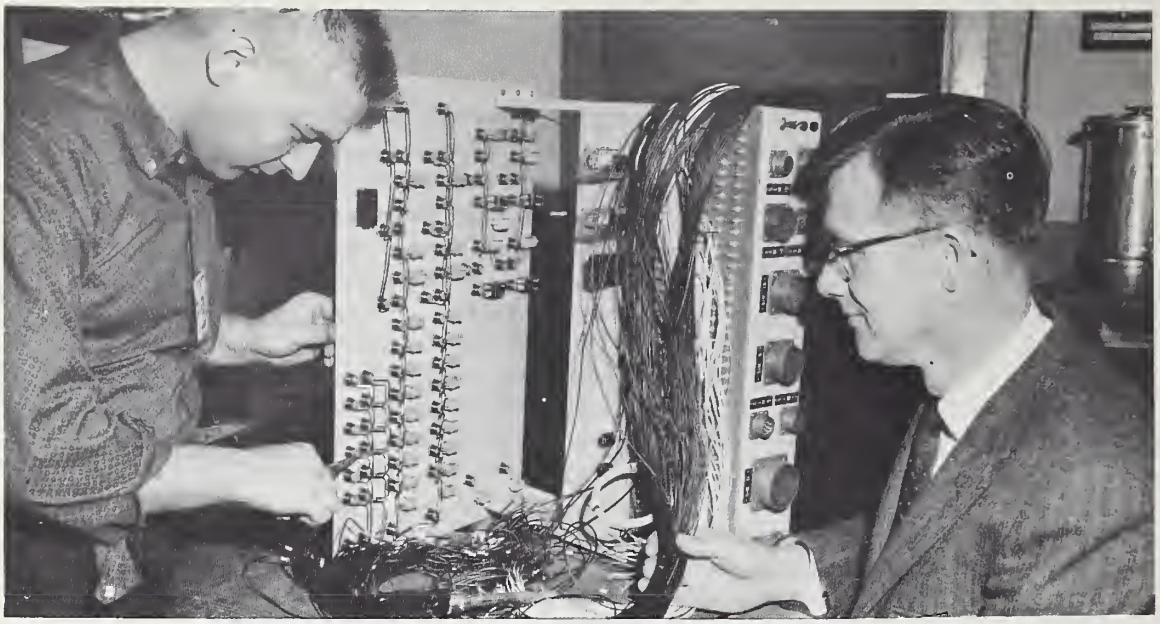
In addition, the safety equipment section is thoroughly reviewed. This includes items of equipment such as alarms, detection devices, personal protective clothing and equipment. Procedures for inspecting, testing, decontaminating and controlled laundering of protective clothing and equipment are reviewed for suitability and effectiveness in providing the desired protection. Specifications, stock numbers and nomenclature are checked for accuracy. At this point, it may be necessary to have laboratory tests made to determine the adequacy of methods and items. Respiratory protective devices must be thoroughly considered. If air supplied units are used, adequacy and freedom from contamination of the air supply must be investigated. Included under the heading of safety equipment are "change rooms" where personnel change from "dirty" (possibly contaminated) to clean clothing and where a shower is provided between the "dirty" and clean areas.

In addition to what has been covered specifically, the overall review includes: compliance with existing regulations, safety codes and standards; requirements for safe handling, processing, transporting, storing and disposing of hazardous materials; pre-assignment, pre-employment physical examinations for medical qualification, plus periodic physical examinations and medical surveillance procedures for personnel engaged in the operation; and trial or shakedown runs of the process, using simulated material, to insure proper working of all devices and to provide training for personnel.

After approval is granted, the supervisor directs the operating personnel to read the procedure. The supervisor explains the procedure in detail and insures that each man understands the contents. Signatures of the personnel are obtained indicating that they have read and understand the requirements.

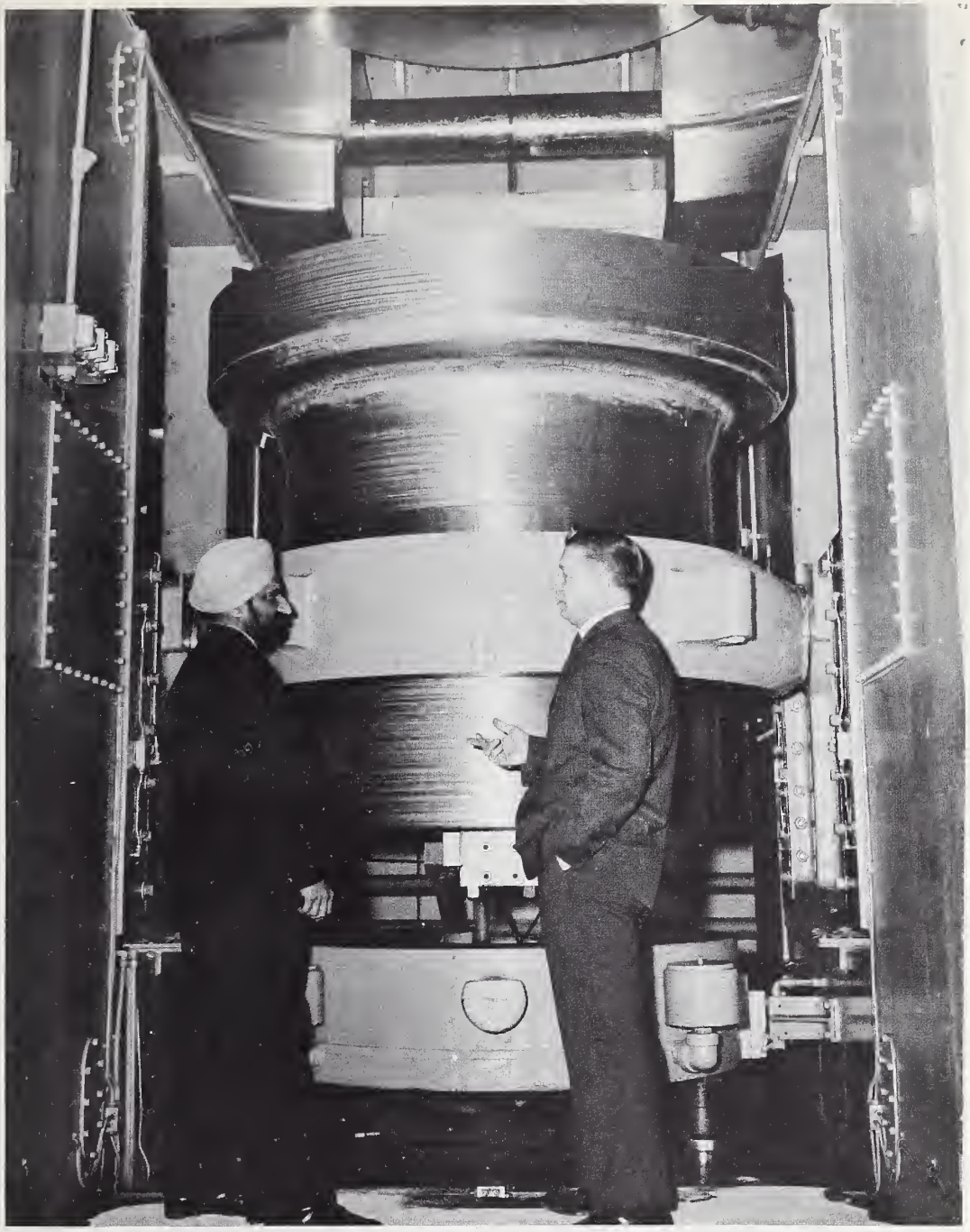
Continued on page 7.

SOME MUNITIONS COMMAND ACTIVITIES ARE SHOWN IN PHOTOGRAPHS BELOW AND ON THE FOLLOWING PAGE.



Complex electronic missile simulator for the Pershing warhead undergoes assembly by a technician in Picatinny Arsenal's Instrumentation Lab. At right is Lab Chief William Conway.

The above weight and center of gravity determining system is located at Longhorn Ordnance Works.



Dr. Sampooran Singh, Indian ballistics expert, examines gigantic hydrostatic press used at Picatinny Arsenal to shape explosive warheads at a pressure of 20,000 pounds per square inch. The one-operation process eliminates costly and time-consuming machining. Dr. Singh, director of the Ballistics Research Laboratory at Chandigarh, India, is the principal scientific officer of that research and development organization. Shown with him is Stephen Herzick, chief of Picatinny's experimental explosives components branch.

HOW SAFE IS THE EMPTY REAGENT BOTTLE

By Frank P. Velotta, Frankford Arsenal

Most laboratory technicians take the safety precaution of working with and handling only prescribed laboratory glassware, equipment, etc., which are considered to be safe and adequate for the intended purpose. However, safety does not stop with the using of the right equipment as a chemist at this Arsenal learned through an unfortunate mishap.

A reassigned chemist was performing the routine chore of dusting the reagent bottles he found stored on the chemical shelf of his new work site. He removed the ground glass stopper of an empty reagent (250 ml) bottle which had previously held ether $(C_2H_5)_2O$. When he replaced the stopper there as a sudden explosion which completely disintegrated the stopper, neck and shoulder of the bottle (see photo). Fortunately, no injuries or property damage (other than the bottle) resulted.

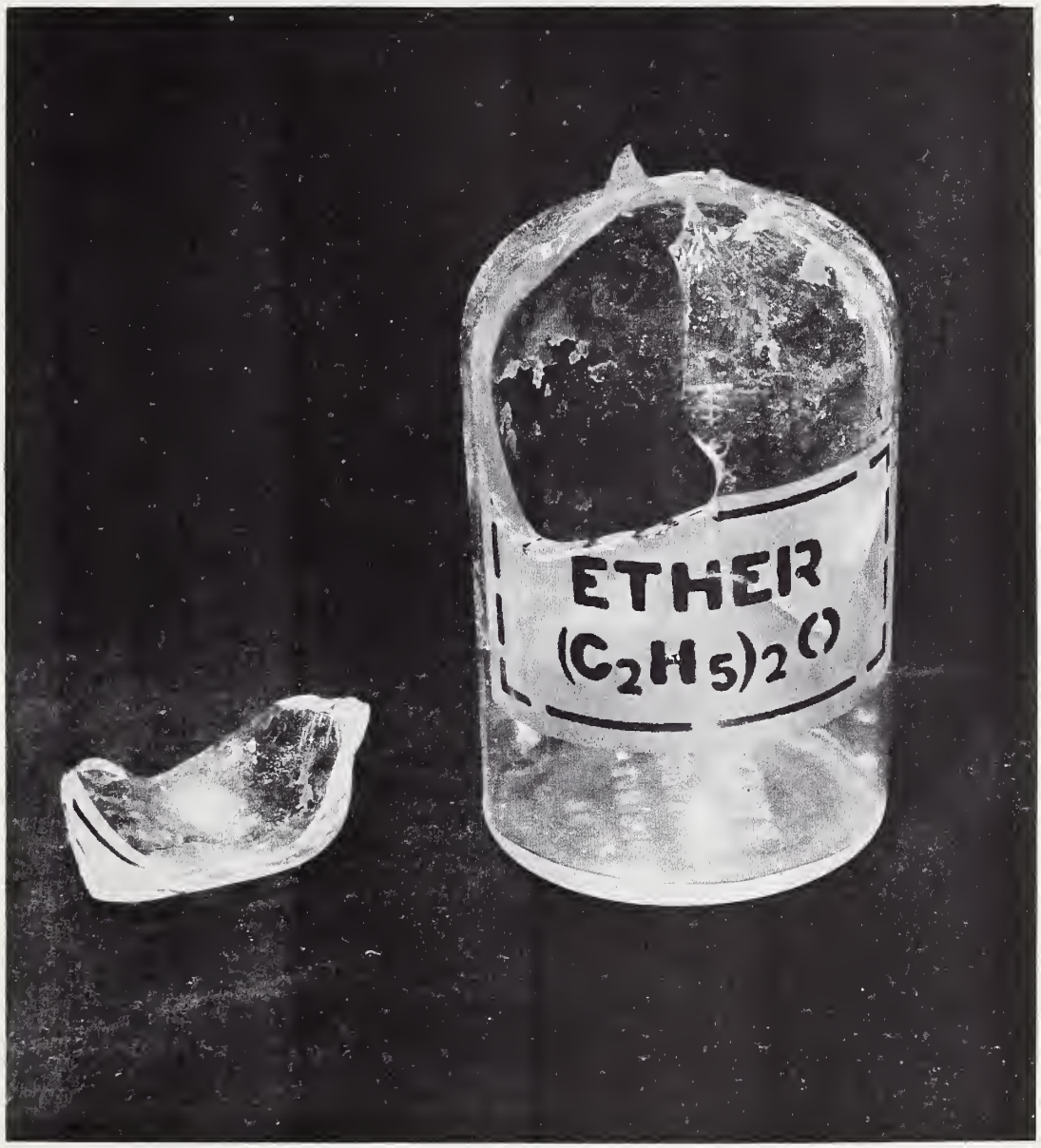
After careful investigation it was learned that the explosion was caused by a residue of unstable peroxides and/or oxides of ether, which had formed in the ground glass portion of the bottle. Ignition was initiated by the friction heat generated when inserting the stopper.

All laboratory personnel should constantly be aware of the danger of allowing chemicals to accumulate and to remain on shelves indefinitely. Equipment and apparatus should be thoroughly cleaned after completion of work.

* *

Continued from page 4.

These Safety Procedures are not intended to be permanent and are amended and changed as changes occur in the development of the operations. They automatically expire at the end of two years, at which time they are reviewed for adequacy and rewritten to incorporate all changes and amendments.



An explosion occurred when stopper was inserted.

DO IT YOURSELF - DANGER AHEAD!

Stephen F. Wawrzasek
Ammunition Procurement and Supply Agency, MUCOM

Recent trends in modern marketing methods and techniques have made available to the consumer a variety of articles in kit form ranging from modeling kits for the hobbyist to boats, airplanes, and homes for the more serious and enterprising individual. The kits are designed to fulfill the desire on the part of the inexperienced to accomplish something creative and to satisfy his material needs within the framework of a limited budget. Many kits require the application of limited skill and considerable energy to accomplish assembly. Their moderate cost is also a reason for their popularity.

The trend to do-it-yourself is not new. It has been a part of the American scene since the picture catalogue advertised "knock-down" household items, children's toys, etc. The trend has not only satisfied the varied needs of the individual consumer, it has done something else, too. It has given rise to individual creativity, the tendency to improve upon, modify, or redesign. It has stimulated self-confidence and reliance upon one's own abilities. In some cases it fostered over-confidence in one's abilities.

The creative genius of the average individual is not uncommon in our highly complex and industrial society. It became apparent when American industry went on a war footing, when labor, management, and the GI were forced to "make do" with limited resources and materials. Many a camp, post, station, and plant has seen its genius at work.

True, many useful innovations were channeled into the total effort; and their value can be considered immeasurable. On the other hand, we have seen many useless if not dangerous products produced. Some of these continue to plague us today. They constitute a threat to safety and a drain on our resources. nevertheless, indiscriminate fabrication of various items and in particular the fabrication of material handling equipment continues unchallenged. Much of the equipment produced locally is found in use with various hazardous operations.

Many who are responsible for the activity are oblivious to current Department of the Army policies and the materials handling equipment standardization program. They continue to allow their sledge-hammer mechanics to fabricate equipment to perform functions for which standard and/or specialized

items have been developed, purchased, and stocked. Much of the unauthorized equipment produced by local shops is of questionable quality. Seldom is it a product of sound engineering. Often safety factors are inadequate and safety features nonexistent.

For example, during a maintenance operation, an explosive-loaded munition was dropped several inches. The incident was caused by failure to follow prescribed procedures. The munition would not have fallen if the sling prescribed in the procedures had been used. Another incident occurred when a locally fabricated stand equipped with four casters was used in the movement of a munition. During movement one of the casters of the stand struck an obstruction causing the stand to tilt. This in turn caused the munition to rise on one side and slide from the stand. It fell approximately two feet. The relative instability of the stand and method of mounting the munition contributed to the incident.

This trend to "build it yourself", if continued, could be the cause of a serious accident. Present experience indicates that a significant percentage of accidents/incidents is attributed to equipment malfunction. Local fabrication of handling equipment or unauthorized modification of existing standardized items will increase the chances of an equipment malfunction. Where our own personal safety is involved, we like a little "extra margin". When we fly, we feel secure in the knowledge that extra precautions are taken by the manufacturer, operator, and the Federal Aviation Agency to assure public safety. We like the "extra margin" provided by "factory-approved" parts, "inspected" work, "tested" aircraft, etc. In locally fabricated equipment this "extra margin" is almost nonexistent, and yet the use of such equipment with hazardous operations continues. We cannot afford the high cost of "local fabrication" any more than we can afford having accidents. From a safety viewpoint this trend to go it alone and build it yourself must be stopped.

Expediency of the moment and a false sense of economy are often used to justify this <u>overt</u> activity. What is overlooked is the fact that handling items for various weapons have been designed to perform specific functions in conjunction with prescribed technical procedures. This equipment has received a technical evaluation to assure its adequacy and acceptability from a safety and utility viewpoint. In view of the fact that qualified engineering development groups exist and produce for the user equipment suited to the task, continued local fabrication cannot be justified. Commanders at all levels should ascertain that these activities are curtailed, that ideas or suggestions for the improvement of material handling equipment are channeled to the cognizant agency. The Army recognizes that individual incentive needs encouragement and certainly,ideas, i.e., (good ones) require recognition. This effort must be directed to achieve the maximum benefit for the Army and recognition to individual achievement.

PANTEX ORDNANCE PLANT BREAKS WORLD SAFETY RECORD

Major General Floyd A. Hansen, commanding general of the U. S. Army Munitions Command, recently remarked that of all similar plants in the world, certainly Pantex Ordnance Plant, Amarillo, Texas, is the safest one in which to work.

Shortly after the first of this year, Pantex broke the world's safety record for the high explosives segment of the chemical industry.

In recognition of this unique achievement, Howard W. Pyle of Chicago, president of the National Safety Council, recently presented Pantex with the Safety Council's Award of Honor.

Pantex, which employs about 1,000 civilians, has not had a disabling injury since May 5, 1959, when a maintenance man suffered a fractured arm in a fall.

The plant has built up a total of 7,295,300 manhours without a disabling accident. The previous record was 7,295,260 manhours established in 1951 by the blasting supplies works at Atlas Powder Company of Tamaqua, Pa.

General Hansen announced the history-making record as he presented the Ordnance Corps Award of Honor for Safety won by the plant in fiscal year 1962 to Major Herman R. Rice, Pantex commanding officer. The General said Pantex employees are safer at work than they are at home.

Pantex is an Army production facility. A large part of the plant's work is in the conventional high explosives field. Some processes involve the handling of radioactive material.

EDITORS NOTE: After establishing the above record, Pantex achieved a new high of 8,000,000 man-hours without a disabling injury by 24 May 1963.

SEAT BELT SAVES DRIVER

By John M. Roche, CBR Agency, MUCOM

On 13 December 1962, a military ambulance was returning to U. S. Army Edgewood Arsenal, Edgewood Arsenal, Maryland, from Aberdeen Proving Ground, Maryland, where the driver had delivered a patient. The driver was making a left turn on US Route 40 to enter Maryland Route 24 while protected by a left turn signal. A truck, proceeding East on Route 40, failed to stop at the red light because of defective brakes and collided into the right side of the ambulance driving it sideways completely across Route 24 (approximately 103 feet) into a parking lot where it struck successively 5 parked cars. The ambulance was a total loss; the 5 cars were extensively damaged; the truck was severely damaged but the ambulance driver suffered only minor injuries. His properly fastened seat belt held him firmly in place even though the door on his side was forced open. If he had been thrown out he could have been crushed between the ambulance and any one of the 5 vehicles struck.

Just prior to the Christmas holidays, Mr. William H. English, Safety Director for Edgewood Arsenal, had the wrecked ambulance put on display at the main gate of the arsenal as a forceful reminder to all post personnel of the value of seat belts. In addition, he gave a complete description of the accident during a series of pre-holiday meetings attended by all military and civilian post personnel.

The Pay Off! There were no motor vehicle accidents reported on or off post to civilian or military personnel during the long Christmas and New Year holiday period --- and publicity for the off-the-job safety program reached at least 170,000 families in the area surrounding the installation.

INNOCENT DRIVER
SAVED BY SEAT BELT

EXPLOSIVES SAFETY

LEAD AZIDE

Excerpts from a report by

S. G. NETTLES, Lone Star Ordnance Plant

We have used RD-1333 Lead Azide since October 1959 through 21 April 1963. We have loaded the following quantities of initiators with this Lead Azide:

M55 Detonator	36,203,850
T379 Delay Detonator	6,456,433
XM74E1 Primer	6,761,300
T92E5 Detonator	1,568,000
XM59 Detonator	1,117,125

During the above period of time we have experienced two lost-time accidents and numerous first-aid cases.

In producing the above quantity of Delay Detonators with RD-1333 Lead Azide, we have experienced a total of 207 fixture blows. In the meantime, in the loading of T379 Delay Detonators using dextrinated Lead Azide, we have experienced four fixture blows in loading a total of 16,855,113. These two items are loaded under identical procedures and tooling (accomplished on hand lines only).

Detailed study of the Lead Azide has revealed that the primary difference between the RD-1333 and dextrinated Lead Azide from the initiation standpoint is the crystal structure. RD-1333 has a large grain with irregular and sharp protrusions, whereas dextrinated has a smaller smooth crystal.

Following is a part of the program that has been in effect at Lone Star to minimize the probability of incidents with RD-1333 Lead Azide:

1. Upon employment, all new employees are briefed in the Personnel Office by representatives of Personnel, Safety, Plant Protection and Production. This briefing consists of approximately one and one-half hours of orientation on Company Policy, Safety Rules and Regulations, Plant Rules and Regulations, Fire Evacuation Plans, and other pertinent information with respect to the plant operation and what is expected of each employee as a condition of employment.

2. After the above briefing, all Production personnel are then assembled on the respective operating lines where they are again briefed by either the Production Manager or Line Superintendent. This briefing consists of a full explanation of what the employee will be required to do, including a full review of the operating line's general safety rules and practices. At this time, the Standing Operating Procedures are explained fully. After this briefing, the employees are moved to the operating line and assigned to their respective work locations by Production supervision. Each individual assignment and the operating procedures are fully explained to the employees until they thoroughly understand how to do their job.

3. In the event the operation involves scooping of initiating explosives, the employees are taught proper procedures for the accomplishment of this work using inert material. These employees are required to demonstrate their abilities to Production supervision's satisfaction prior to being assigned to the actual operation of scooping initiating explosives. The type of explosives, characteristics of the explosive, and other precautions are again explained to the employee at this time. From this point throughout their employment, a constant follow-up is made by Production supervision and the Safety Engineers assigned. During the past year, 44 employees have been disqualified on the detonator operation because of not being able to show sufficient ability to perform the necessary job functions.

4. With respect to analyzing the operations and hazards, it should be pointed out that an inspection team examines each operating line prior to initial production. This team consists of the Line Superintendent, Line Safety Engineer, Line Engineer, Production Manager and the Division Directors of Production, Safety, Quality Control and Technical, Engineering, and COR Safety. In addition, the Industrial Engineering Section, Production supervision, Technical Engineers, and Safety representatives are constantly observing the operations for improvement.

5. Safety Meetings are held twice monthly on each line for a period of thirty minutes each. At these meetings, all employees are asked for suggestions for improving the operation. In fact, some of the meetings are conducted by the employees. Minutes of these meetings are submitted to Plant Management and they are discussed at our monthly Safety Board Meetings, when necessary.

6. Since 1 January 1962, we have trained a total of 1,332 employees on our detonator lines.

7. Detonator hand lines tooling is designed to contain the emplosion of an individual unit and we have never experienced a failure. This again points out that we have recognized these hazards and provided all possible protection to the employees.

8. One of these areas just completed one year with over 1,000,000 man-hours without a lost-time accident. During this period of time, a total of 755 employees were trained. A total of 577 employees have been trained on the other detonator line with one lost-time incident, which occurred 16 April 1963. This incident involved a receptable of RD-1333 Lead Azide at the scooping station.

Since the beginning of the use of RD-1333 at Lone Star, we have had a continuing program of seeking improvement in the grain structure of RD-1333 Lead Azide. The military specifications covering this Lead Azide have no physical requirements concerning the grain structure or size. We have experienced various trends in the shape and construction of the crystal from a relatively smooth crystal to begin with, to a small dust type crystal, to the current large irregular shaped crystal.

GROWTH OF COMPOSITION B

By R. T. Schimmel and S. J. Lowell
Picatinny Arsenal

Recently, explosives engineers were surprised to learn that Composition B, a common explosive in munition items, refused to stay put in its original volume. After storage at 160°F for 14 days it protruded from its confines as much as .70 inch.

Needless to say, growth of this magnitude in an item only 24 inches long was of great concern because of the functional and safety aspects involved. Growth in TNT and TNT-containing explosives has been known for a long time. However, engineers have believed that they were satisfactorily coping with the problem by making small allowances for growth. When special studies and field reports revealed that excessive growth (not to be confused with thermal expansion) was a real problem, PA engineers immediately commenced the arduous task of tracking down the responsible factor or factors involved.

It was found in a series of tests that by eliminating or controlling the flow of the low melting materials in the explosive and eliminating the low melting interior coating of the metal parts the growth was reduced to a maximum of 0.070 inch under the same storage conditions which yielded 0.70 inch growth. The combination of conditions that produced the smallest amount of growth was Composition B4 cast into a burster tube coated with an iron oxide primer paint (Spec MIL-P-22332). Composition B4 is the same as Composition B except that the desensitizing wax contained in Composition B is removed and the calcium silicate is added.

At present, in order to live with the small amount of unavoidable growth, it is necessary to make allowance for it by loading the explosive slightly under the maximum volume requirement.

NEW SAFETY GUIDE ON AMMONIUM NITRATE FUEL OIL BLASTING AGENTS

Constantly changing trends in the manufacture and use of ammonium nitrate-fuel oil blasting agents have prompted the Bureau of Mines to revise once again its list of safety recommendations for these explosive mixtures, the Department of the Interior announced.

The newest revision, just published by the Department, became necessary primarily because of the increasing use of premixed AN-FO--a practice that calls for more attention to techniques of bulk transportation and storage. Several new precautions are urged by the Bureau to guard against the additional hazards, including a warning against prolonged storage of AN-FO that could result in evaporation of oil from the mixtures and make them less reliable. For trucks carrying blasting agents, various types of fire extinguishers are suggested, and the Bureau advises that such vehicles should not simultaneously carry acids or other corrosive liquids.

More emphasis is placed also on procedures designed to promote safe use of AN-FO in underground mining, an application that has increased sharply in the past two or three years. Danger from static electricity and stray electrical currents underground is covered more fully in the new list of recommendations, and the Bureau recommends that, where pneumatic equipment is used to place explosive charges, all hoses on such equipment be of semiconductive material that can permit dissipation of static electricity while limiting the flow of stray currents.

AN-FO mixtures became popular about eight years ago, when it was determined that a small percentage of fuel oil added to fertilizer-grade ammonium nitrate would produce a cheap, reliable blasting agent. In 1958 the Bureau drew up a list of tentative safety recommendations for AN-FO, and the list has been updated three times since then.

Like the last edition, the new list covers many other aspects of the subject, such as AN-FO mixing practices, recommended composition, a suggested detonator cap-sensitivity test, and methods of dealing with fires in ammonium nitrate and AN-FO mixtures. The number of recommendations has been raised from 62 to 85, and the publication now includes, as an appendix, the American Table of Distances for Storage of Explosives.

Bureau of Mines Information Circular 8179, "Safety Recommendations for Sensitized Ammonium Nitrate Blasting Agents," was prepared by the Bureau's Explosives Research staff. Single copies of I.C. 8179, which replaces I.C. 7988, can be obtained free from the Publications-Distribution Section, Bureau of Mines, 4800 Forbes Avenue, Pittsburgh 13, Pa.

News Release
Department of the Interior

CURRENT EVENTS

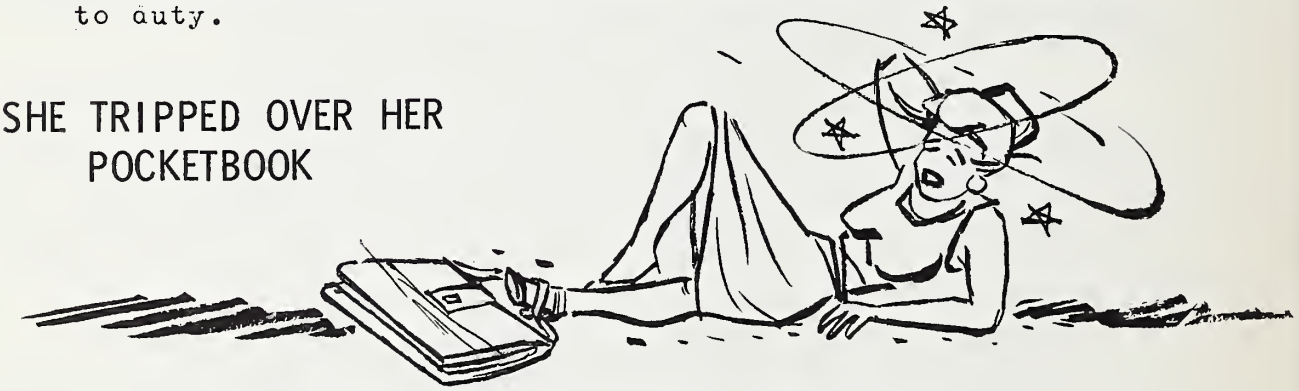
MY FULMINATE AND YI! YI! YI!

While an enlisted man sat talking in the barracks with a group of his friends, he poured fulminate of mercury from a glass vial into an ash tray in which there was a lighted cigar. The fulminate ignited and blew up the vial which was still in his hand. This resulted in an amputation of his finger.

Investigation disclosed that the enlisted man is a graduate chemist and made the fulminate of mercury while on duty 6 months before. The substance was kept in his footlocker in his barracks.

Troop commanders will undergo non-scheduled "Shake Down" inspections of wall and footlockers of all on-post military personnel. The Commanding Officer will institute Courts Martial proceedings when the enlisted man returns to duty.

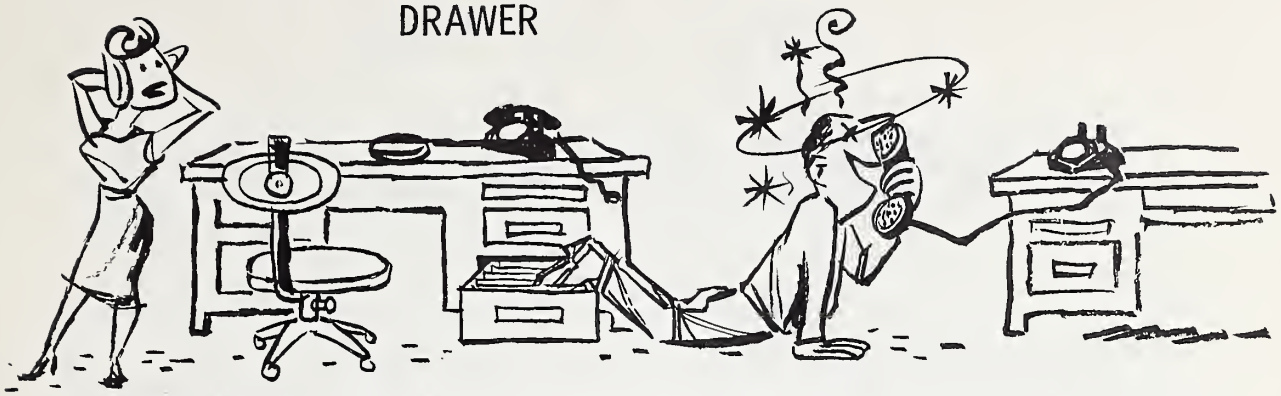
SHE TRIPPED OVER HER POCKETBOOK



A female employee was injured when she got up from her desk and fell over her pocketbook which she had left on the floor.

Employees will be cautioned to keep pocketbooks in some other location. Handbags must be put away and not left on floor to create a tripping hazard.

HE TRIPPED OVER HIS DESK DRAWER



An Army civilian employee, age 62, was working at his desk with the lower left drawer open. He arose suddenly to answer the telephone on another desk. He tripped over his open desk drawer and fell first against a concrete column and then to the floor injuring right shoulder and right leg.

Employee awkwardness and failure to observe safe office practices contributed to this accident.

In order to prevent the recurrence of similar accidents, the employee has been reinstructed in safe practices to follow and he will attend safety meetings on office ssfety. In addition, after a physical examination, he is under his personal physicians direction to lose weight.

A military man opened what he thought was a door to the men's room. He promptly fell down a flight of stairs leading to the basement.

His eyes and forehead were badly bruised and he received a brain concussion as a result of this accident.

Investigation showed that the doorway to the stairway leading to the basement was unmarked, and situated on the same level adjacent to a doorway leading to a men's room.

Action was immediately taken to mark the basement door "Stairway", place a lock device on this door, and install continuous lights in the stairwell.

"TEFLON" - HEALTH HAZARD

1. INTRODUCTION. "Teflon" is a trade name used to identify the TFE-fluorocarbon (tetrafluoroethylene) resins produced by the polymerization of an unstable gas of the same name. Teflon is a white granular inert powder unaffected below its melting point (327° C) by anything other than alkali metals and heat. Since it is practically indestructible under most conditions of use, and has almost universal chemical inertness and excellent dielectrical properties, it has found wide application as gasket material for jet engines, as insulation for electrical equipment, as valve packing for chemicals, as hydraulic hose, in human prosthetic devices, and in a wide range of other uses.

2. PHYSICAL PROPERTIES INFLUENCING TOXICITY. Teflon resins are among the most thermostable of all the synthetic resins being rated for continuous use at 250° C. At this temperature the weight loss is 0.0001 to 0.006 percent per hour, depending on the type resins. At 391° C, the maximum weight loss is 0.071 percent per hour. Above 250° C, varying types and concentrations of decomposition products are liberated depending on the specific type of resin under consideration and temperatures reached. Although much is known about the toxicity of several of the individual decomposition products from animal experimentation, no practicable way of expressing a safe concentration of mixtures of the products has yet been devised. In the absence of more complete toxicity information and suitable analytical methods for measuring decomposition products, a threshold limit value has not been established (American Conference of Governmental Industrial Hygienists Threshold Limit Values for 1962).

3. HUMAN TOXICITY - POLYMER-FUME FEVER. The only definite adverse effect on health of humans reliably reported from the use of Teflon resins has been the polmer-fume fever which produces symptoms commonly described as being similar to those of influenza. These symptoms which include chills, fever of varying degree, body aches, headaches, irritated throat, dry cough, and chest pains, do not appear until two to six hours after exposure, and pass away within 36 to 48 hours. Most cases of polymer-fume fever have occurred in individuals working at operations involving cutting and

grinding fabricated parts with high speed tools, and have been associated with smoking Teflon-contaminated cigarettes. No deaths or permanent injuries have been known to stem from the use of TFE resins in the product's 20-year history of use.

4. INDUSTRIAL HYGIENE SAFEGUARDS.

a. Industrial Operations Where Intense Heat (Over 275° C) is involved. At industrial operations of this nature, such as fabrication, grinding, welding, and soldering, adequate local ventilation should be provided to avoid inhalation of toxic decomposition products of Teflon. In machining operations the use of coolants is an effective means of preventing overheating. Such operations should be evaluated routinely to determine the adequacy of control measures.

b. All Industrial Operations Involving Teflon. Cigarettes or other smoking tobacco products carried into work areas where Teflon dust or fumes are present should be covered or otherwise protected to prevent contamination of the tobacco products with Teflon dust or particles.

c. Disposal of Teflon Waste. Scrap Teflon may be disposed of by burying or burning. Small amounts (1 or 2 pounds) may be safely burned with general refuse in an out-of-doors incinerator, normal care being taken to avoid inhaling smoke and fumes from the fire. Larger amounts should not be burned at one time. (The major problem is again the pyrolysis products of these resins, but under these circumstances it is primarily an economic use - the destruction of plant life.)

d. Fire-fighting. Fireman fighting fire in which there is risk of Teflon decomposition should wear respiratory protective equipment which provides protection against acid fumes, organic vapors, and finely divided particulate matter. (Recommend a Universal Gas Mask with special filters, Type N, with BM-approved number including an A; see TB MED 223.)

e. Oxygen Producing and Charging Plants. In the rare instance of fire or explosion associated with the use of an oxygen compressor, and if the compressor at the plant has Teflon packings, pyrolysis products of Teflon will be formed. Under these circumstances the area should be ventilated before employees re-enter to accomplish the necessary repairs.

5. NONHAZARDOUS EXPOSURES. Accidental swallowing of resin does not present any health hazard; and the resins are nonirritating and nonsensitizing to the skin. Inhalation of dust, at room temperature and containing no decomposition products, presents no problem, except as a nuisance. The normal use of Teflon-coated cooking utensils is not considered an undue health hazard.

6. CONSULTATIVE SERVICES. Additional specific information on toxicity and engineering controls may be obtained from this Agency on request through channels to The Surgeon General, ATTN: MEDPS-PO. (See AMCR 385-7)

U. S. Army Environmental Hygiene Agency Technical Guide (Med)

SAFETY AWARDS

Springfield Armory recently was awarded a National Safety Council Award of Merit for achieving 1,512,705 manhours without a disabling injury from 27 October 1962 to 25 January 1963. Well done, Springfield Armory! Now how about shooting for the big one?

The operating contractor for Ravenna Ordnance Plant received a well-deserved Certificate of Commendation from the National Safety Council for operating 698,020 manhours without a disabling injury during the period 17 April 1961 through 31 December 1962. The plant had reached 791,000 disabling injury-free manhours as of 12 April 1963. In the past ten years, the plant has earned six NSC, eight D/A and seven group Portage County safety awards.

Sacramento Army Depot was honored by the Sacramento Safety Council at a banquet and ceremony on the evening of 2 April 1963. In competition with other government agencies and a majority of the larger commercial industries of Sacramento City and County, this Depot attained the first place award for motor vehicle safety and second place award for industrial safety.

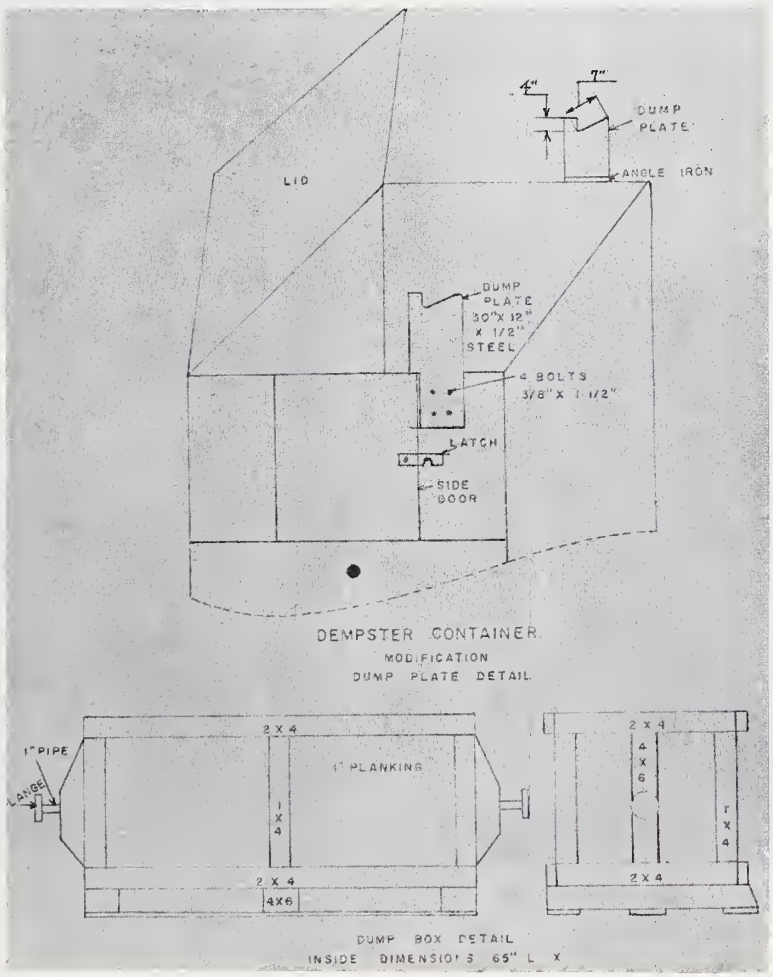
Ideas which will promote safety are always welcomed by anyone engaged in accident prevention.

Tobyhanna Army Depot adopted an idea suggested by an employee for the handling and disposing of scrap lumber generated in the box and crate shop operations.

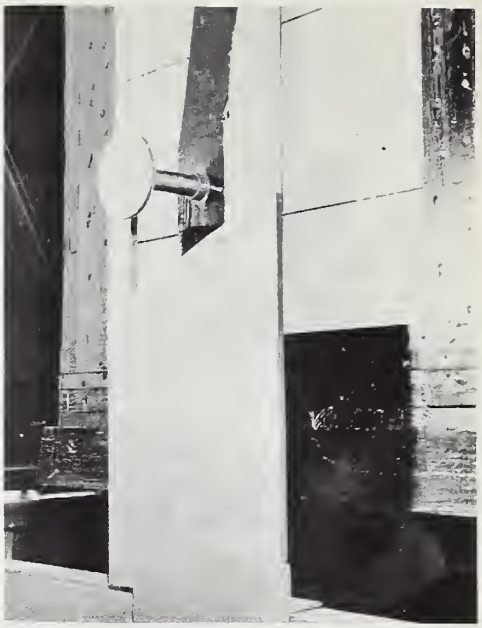
A minor modification was made on a Dempster container, and a scrap lumber container was built. When the idea was put into use, the overall safety of the entire operation had been improved.

The captioned photographs and schematic drawing illustrate how the operation is now being performed and the modification of the Dempster container.

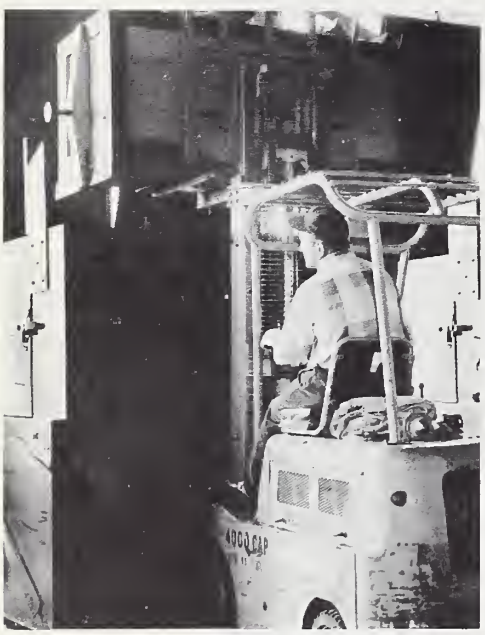
If this suggestion (#3612) is used by your installation, please advise the Secretary, Incentive Awards Program, Tobyhanna Army Depot, Tobyhanna, Pennsylvania.



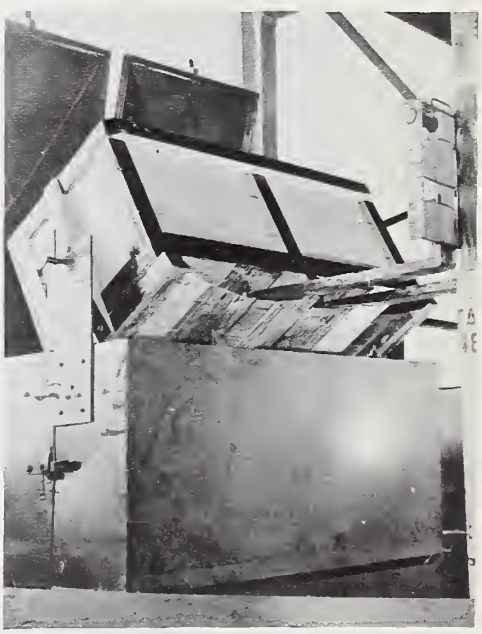
Flanged steel pins inserted into pin holes in scrap wood container.



View of the modification on the Dempster container showing scrap wood container being lowered into position.



Over-all view of scrap container placement in fixture.



View showing raising of forks and tilt and turning scrap wood container to the inverted position.

END PRODUCT SAFETY

James R. Sampson
Safety Director, USA Weapons Command

The combat efficiency of the Army depends on a great many things. The manpower is not very effective without the firepower and the firepower is not very effective without the manpower. Conservation of both the manpower and the firepower is therefore essential to assure combat readiness. It must always be remembered that the firepower is not very effective if it cannot be used safely.

The firepower furnished the fighting soldier must be designed, developed, tested, and manufactured with an assurance of safety to the user as well as fulfilling the military characteristics which established the need.

End product safety is not a special mission assignment. It is one of the operating principles which will assure effective, therefore, safe firepower. A weapon which blows up in the hands of the user is not an effective weapon - yet it may have been designed to meet all the assigned military characteristics.

If our end products are not safe in the hands of the user, we have failed to consider and to recognize our total responsibility in the design, development, test, manufacture and use of our assigned mission items.

The Army's safety program:

a. seeks to identify and eliminate needlessly hazardous conditions,

b. establishes safe practices consistent with military operations,

c. prevents injury and loss of life resulting from accidents, and

d. avoids wasteful damage to property.

The safety problem becomes more complex as the weapons, machines, and missions become complex. Every new bit of research carries with it a new risk. We must determine what that risk is and its magnitude. Then necessary protection must be designed into the end product or sufficient guidance provided to assure that the customer can use it safely and effectively.

The user is assured an effective and safe weapon through environmental testing, human engineering tests, proof tests, and acceptance tests.

Safety for testing agency personnel is further assured through a safety statement which is added to the test requirements. Safety releases by the testing agency assure safe user testing and the final safety confirmation assures the user an effective and safe weapon.

After the weapon has been accepted by the user, additional means have been provided to correct any deficiency (including safety deficiencies). UER's (unsatisfactory equipment reports) and MWO's (modification work orders) provide such means.

It is assumed that sound engineering principles have been utilized in the design and considered in the entire sequence of birth to death of a weapon. They are an inherent requirement in any design.

Some of these basic principles are:

a. The application of a "factor of safety" to each component design.

b. The consideration and application of mandatory roadability requirements.

c. The consideration for proper stowage of equipment, tools, components, and ammunition items.

d. The consideration, when necessary, that critical components fail safe rather than fail unsafe.

e. The consideration that electrical components are designed to eliminate the possibility of electrocution of the operator and maintenance personnel.

f. The consideration of operational environments (e.g., hazardous atmospheres) in the design of electrical gear.

g. The consideration of total strength requirements for each component over its entire range of use.

Beams and hoists should have a factor of safety added to actual load requirements. Recoil mechanisms should be designed for the actual thrust of the greatest zone of fire, plus a factor of safety.

Safety tow chains are mandatory for towed vehicles that are to be used over primary and secondary roadways. Provisions for safe stowage should be included when designing vehicles or launchers that are to carry equipment, tools, components and ammunition.

Great expenditures of funds are made in research and testing to provide lighter-weight materials with equal or greater strength. These materials must still have the strength for the job they have to do.

Sacrifices of sound engineering principles undoubtedly will be found; sometimes as the result of an accident or incident. Thus, a potentially effective weapon may be eliminated as a mission requirement.

End product safety cannot be left to chance and it must be considered on the drafting board, through manufacture, testing, supply, and storage if our combat effectiveness and readiness have any assurance whatsoever.

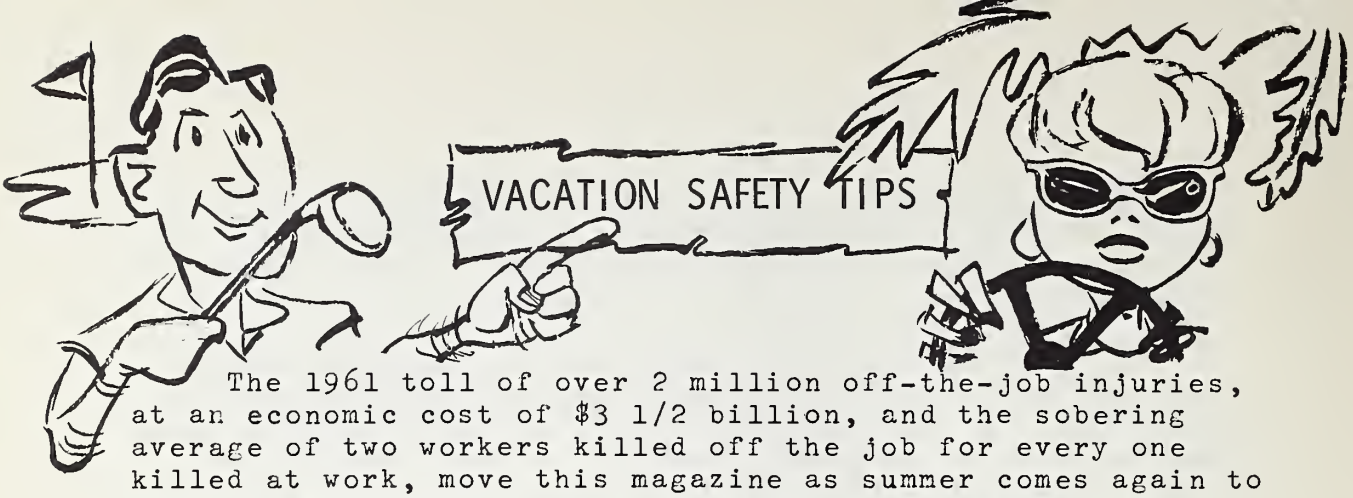
It is the responsibility of the Safety Director to consider end product safety as a part of his total safety program and he must establish relationships with all operating officials to assure that safety is considered in the span of life of these end products. Unsafe end products are a reflection on our capability and our effectiveness in supplying the fighting soldier the tools for the defense of this nation.

NEW ARMY SAFETY PROGRAM REGULATION

AR 385-10
8 April 1963 Army Safety Program

This important regulation supersedes AR 385-10, 23 July 1959 and subsequent changes; AR 385-16, 29 September 1960; AR 385-18, 11 May 1961; AR 385-20, 24 October 1960; and AR 385-220, 1 May 1959 and subsequent changes.

Included in this newly issued publication are regulations governing safety training, promotional and educational materials, and awards.



The 1961 toll of over 2 million off-the-job injuries, at an economic cost of $3 1/2 billion, and the sobering average of two workers killed off the job for every one killed at work, move this magazine as summer comes again to print the following vacation safety tips assembled from recognized sources. They are presented in the hope that they may impel both our readers and ourselves to practice those safeguards we already know we should practice, but often don't.

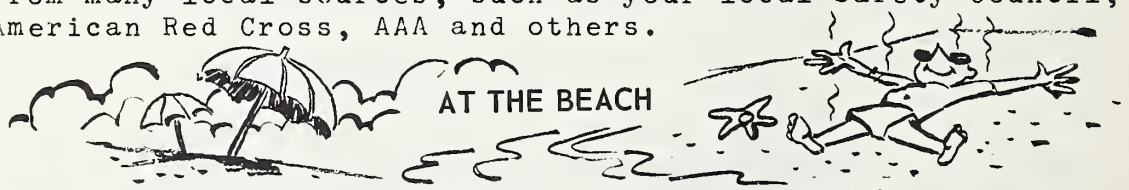
The most frequent cause of fatal accidents is, of course, the motor vehicle; this is followed by falls; fires and explosions; drowning while boating, swimming, or fishing; or the cause may be firearms, poisons, drugs, chemicals, poisonous gases--principally carbon monoxide; machinery and tools used at home; suffocation; and falling objects. There are many more causes of fatalities and injuries.

Have a thorough safety check of your car before setting out.

Keep alert while driving.

Allow for highway, traffic, and weather conditions, and for time of day.

Detailed suggestions on these safeguards are available from many local sources, such as your local Safety Council, American Red Cross, AAA and others.



Suntan gradually, starting with 5 minutes' exposure the first day, and slowly increase exposure time. (You can get burned on a cloudy or overcast day as well as on a sunny one.)

Avoid heat exhaustion, heat cramps, sunstroke, and heatstroke which may result from prolonged or excessive exposure to sun or heat.

Don't look up at the sky--ultraviolet rays are bad for the eyes.

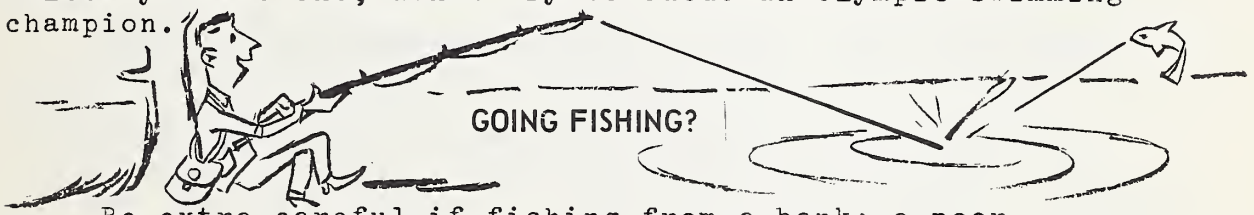
Don't swim alone--even if you are a good swimmer. Have someone near to give aid or call for help if needed.

Know the swimming (or wading) area, currents, step-offs, or hidden stumps and rocks before starting to swim or dive.

(A serious but little known hazard is found in water storage ponds in rural areas. The modern version of the ole swimmin' hole lures many youngsters unable to swim properly, or at all. Some experts believe these ponds should be enclosed for safety's sake, but, youngsters should at least be cautioned to stay away from this danger.)

Don't swim when overtired or overheated or for an hour and a half after eating.

Liquor consumption and swimming don't mix; nor do horseplay and attempting swimming feats beyond your skill. Unless you are one, don't try to outdo an Olympic swimming champion.

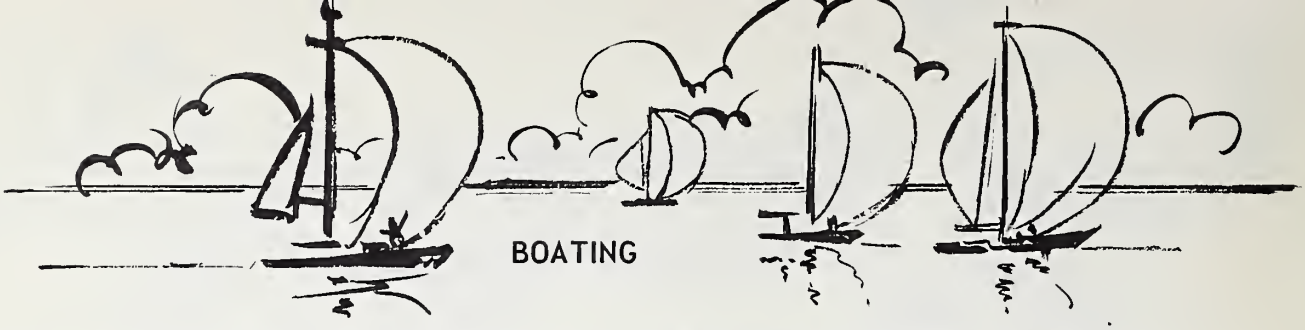


Be extra careful if fishing from a bank; a poor swimmer can fall into deep water and may be unable to get out.

If fishing from a boat, follow the common-sense boating rules about proper loading, capacity of boat, changing positions or standing up in the boat. (Also see BOATING below.)

Stay away from dams, either above or below--both spots can be dangerous.

Be careful with fishhooks and lures when casting. If a hook gets caught in the skin, push it through and snip off the end or cut line and take the victim to a doctor.



BOATING

If you have newly joined the 35 million Americans who use pleasure craft for everything from fishing, cruising, camping, hunting, and swimming to waterskiing and skin diving, have your craft inspected for safety and take advantage of the safety training courses available through the Coast Guard Auxiliary.

The Auxiliary will give you a courtesy examination of your boat, extensive courses in seamanship and small boat handling, instructions in docking, anchoring, river boating, locking, aids to navigation, and other safeguards.

Know the numbering requirements of your State or, if none, of the U. S. Coast Guard; the equipment requirements; rules of the road (traffic laws); and accident reporting requirements.

Before getting underway, check the weather; tell some responsible person where you are going and when you intend to return.

Check the fuel supply to assure enough fuel for the round trip.

Close all doors, hatches, and ports while fueling; extinguish galley fires and pilot lights; prohibit smoking; keep the filling nozzle in contact with the fill pipe to prevent static spark; avoid spilling. After fueling, thoroughly ventilate all compartments and check the machinery and fuel tank areas for fumes before attempting to start the motor.

Carry Coast Guard-approved lifesaving equipment for every person aboard. Children should always wear life preservers, and "all hands" as well whenever the weather or other situation causes the slightest anxiety about safe passage. Check lights if you plan to be underway after sunset.

Stow all gear properly.

If you pull a skier--

Have someone watch him; you cannot do so and drive at the same time.

Stay away from fishermen, swimmers, and other boats.

Always stop the motor when helping a skier into the boat; don't rely on idling in neutral and risk unintentional gear engagement.

Don't ski or help others ski at night.

If caught in a squall--

Have passengers sit on the floorboards or in a manner to keep the center of gravity low and reduce wind resistance.

Head into the wind and waves at slow speed, keeping enough headway on the boat so she holds her course or avoids being blown against shoals or shore.

If the engine stops, or the fuel supply runs low, drop anchor and pay out sufficient line to ride out the storm.

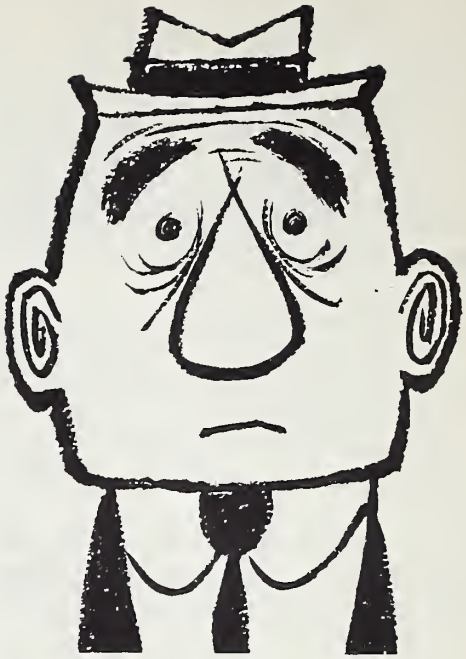
LIGHTNING ANYWHERE

Get inside a structure, stay where it is dry, away from chimneys, fireplaces, stoves and metal objects.

The foregoing safety suggestions are not intended as a complete list covering all possible vacation hazards. However, they do consist of common-sense rules, any of which may save lives or prevent disabling injuries.

SAFETY STANDARDS
U. S. Department of Labor

DO YOU KNOW?



For the purpose of testing your knowledge of current AMC Regulations, the following questions are offered. The correct answers, and references, are shown on pages 35 and 36. A suggestion is to compile questions that are significant and pertinent to the operations of your installation, and use them for basis of discussion, or questions and answers in your local publications.

1. How many exits are required for small explosives operating rooms or cubicles having substantially constructed walls on three sides and occupied by not more than two persons:

   Answer:

   Reference:

2. What preventive action is required when a fastener such as a nut or bolt is used in a manner which makes accidental entry into explosives or explosives constituents possible?

   Answer:

   Reference:

3. What is the maximum permissible surface temperature for lighting fixtures in atmospheres containing explosives dust?

   Answer:

   Reference:

4. How often must conductive floors be tested?

   Answer:

   Reference:

5. What publication prescribes uniform signals for movement of material by cranes?

   Answer:

   Reference:

6. How wide should the firebreak be around an aboveground-type magazine?

   Answer:

   Reference:

7. What are some examples of chemicals that should not be stored with hydrochloric acid?

   Answer:

   Reference:

8. Under what conditions is it permissible to use heat in a magazine used for storage of explosives and ammunition?

   Answer:

   Reference:

9. How far away from railroad grade crossings on AMC installations should the roads be marked to warn motor vehicle operators?

   Answer:

   Reference:

10. What is the minimum number of persons permitted in a range party on any recovery field or impact area?

    Answer:

    Reference:

HOUSEHOLD HAZARDS

National Institutes of Health
Plant Safety Branch News
U. S. Dept of HEW

*ALUMINUM HOUSE SIDING. The electrical connection from the power line to the house should be made by competent personnel, and the siding should be bonded and grounded to prevent it from becoming a fire or shock hazard. In a Maryland home last spring, a service line "pigtail" contacted the aluminum siding charging it. The current passed via nails and cable to the wooden frame and ignited it.

*ARTIFICIAL FOOD. Some practical joke "foods" have become so realistic that they can fool your eyes and taste buds and perhaps kill you. In West Germany a man died from eating a piece of plastic "cheese" sold in a joke store. The "cheese" is thought to be imported from Japan and may be available in the United States.

DRY CLEANING. The nonflammable perchlorethylene solvent used by the Do-It-Yourself dry cleaning establishments can make you woozy. Stay as far from the washer-dryer as possible while the machine is operating.

Don't use a dryer for clothing washed with a flammable solvent - this misuse has caused at least one explosion.

At a local wash-dry emporium, one NIH employee observed that the limit switch to the cover of a high speed extractor was inoperative- the lid could be lifted without cutting off the power.

Recently a Prince Georges County woman lost her arm to a defectively safeguarded centrifugal dryer.

PLASTIC FLOWERS. Artificial plants, leaves, and flowers made of plastic are being marketed and are proving to be popular items, but the very delicate lacy pieces, may ignite quite readily, and almost 90% of all such plastic materials will ignite if a match is held close to them for just a short period of time. These plastics normally burn like parafin or wax, producing dripping balls of fire or puddles of burning liquid. In addition they give off extremely toxic nitrogen dioxide. --*Health & Safety Bulletin, University of Minnesota*

* *Family Safety, National Safety Council*

WELL DID YOU KNOW?

Safety personnel undoubtedly know most of the answers to the questions on pages 32 and 33. However, are operating personnel familiar with these answers?

1. One properly located exit.

   Reference: Paragraph 507, ORDM 7-224

2. The nuts and bolts must be securely held in place by being drilled and thonged or otherwise secured.

   Reference: Paragraph 518b, ORDM 7-224

3. Maximum of 228°F. (109°C) when operating at an ambient temperature of 80.6°F (27°C).

   Reference: Paragraph 614b, ORDM 7-224

4. Tests shall be made semi-annually.

   Reference: 707a, ORDM 7-224

REFERENCE PUBLICATIONS

5. American Standards Association, Code for Cranes, Derricks, and Hoists

   Reference: Paragraph 904a, ORDM 7-224.

6. At least 50 feet wide. The firebreak shall also be free of combustible material.

   Reference: Paragraph 1216a, ORDM 7-224

7. Nitric acid or strong oxidizing chemicals.

   Reference: Paragraph 1304, ORDM 7-224

8. Where heating may be necessary to prevent condensation of moisture or to maintain constant temperature.

   Reference: Paragraph 1805b, ORDM 7-224

9. 100 feet

   Reference: Paragraph 2105a, ORDM 7-224

10. A range party shall consist of at least two persons.

    Reference: Paragraph 2812, ORDM 7-224

AMC Regulation 10-33	Organization and Functions - Mission and Functions of U. S. Army Management Engineering Training Agency
AMC Regulation 705-5 28 March 1963	Research and Development of Materiel-Preliminary Operating and Maintenance Manuals

REAR COVER

The rear cover shows a mobile item known as the M3A3 Decontamination Apparatus. It consists of a 400-gallon special tank mounted on a standard 2 1/2-ton truck. A pump incorporated in the mechanism allows controlled pressure of zero to 475 pounds per square inch on two spray outlet hoses.

HEADQUARTERS
UNITED STATES ARMY MATERIEL COMMAND
WASHINGTON 25, D. C.

July 1963

AMC Pamphlet 385-54 is published for the information of all personnel of the U. S. Army Materiel Command.

(AMCAD-S)

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